"On the Relation between Magnetic Stress and Magnetic Deformation in Nickel." By E. TAYLOR JONES, D.Sc. Communicated by Professor ANDREW GRAY, F.R.S. Received January 13,—Read February 25, 1897.

(Abstract.)

The experiments described in the paper constituted an attempt to determine whether the change of length which a nickel wire experiences when placed in a magnetic field can be explained by means of the stresses which are known to exist in consequence of the magnetisation.

The method of calculating the effect of magnetic stresses on the dimensions of a magnetised body was given by Kirchhoff and applied by Cantone to the case of an ellipsoid of revolution of soft magnetic material placed in a uniform longitudinal field.

The expression given by Cantone for the elongation of an ellipsoid of revolution contains terms representing the effect of Maxwell's system of stresses, and also terms representing the effect of those stresses which arise in consequence of the fact that magnetisation depends upon strain.

It is shown that the latter terms reduce, when the eccentricity of the ellipsoid is great, to $\frac{1}{2} H \frac{\delta I}{\delta P}$, where δI is the increase of magnetisation of a cylindrical portion of the material caused by an increase of tension δP per unit area, and H is the magnetising field.

It is also shown by an independent method, due to Professor J. J. Thomson, that the term $\frac{1}{2} H \frac{\delta I}{\delta P}$ represents the elongation of a long cylinder of the material, supposed uniformly magnetised, due to the stresses which exist in consequence of the dependence of magnetisation on strain. Hence, since this term is generally numerically great in comparison with the terms representing the effect of Maxwell's stresses, a very long cylinder of the material could be used for the measurement of both the magnetic elongation and the effect of tension on magnetisation.

The specimen used in the experiments was a long wire of annealed nickel. The magnetisation and the effect of increase of tension on magnetisation were first measured for a series of field-strengths and for two different tensions, these measurements being made by the ballistic method.

Then the magnetic elongation was measured, in independent experiments, for a series of field-strengths and the same two tensions, it being arranged that the nickel wire was in the same magnetic

state in the elongation experiments as in the magnetisation experiments. The change of length of the wire was magnified and measured by causing a lever, whose arms were in a great ratio, to deflect a mirror which was observed by means of a telescope and scale at a considerable distance.

The observed change of length was always a contraction. The change of length calculated from the theory of stresses was also always a contraction, the preponderating term $\frac{1}{2}H\frac{\delta I}{\delta P}$ being always negative.

The difference between the observed and calculated contractions was, however, considerable, the theory only accounting for a part of the observed contraction.

Diagrams are given showing the values of the magnetisation, of the effect of increase of tension on magnetisation, and of the observed and calculated contractions, all as functions of the field H.

It was found that the difference between the observed and calculated contractions was approximately proportional to the fourth power of the magnetisation, a diagram showing that, if this corrected contraction be represented as a function of I^4, the points all lie very near a straight line passing through the origin, the deviations being within the limits of experimental error.

" On the Relations between the Cerebellar and other Centres (namely Cerebral and Spinal) with especial Reference to the Action of Antagonistic Muscles. (Preliminary Account.)" By MAX LÖWENTHAL, M.D. (Würz.), M.R.C.P., and VICTOR HORSLEY, F.R.S., F.R.C.S. Received February 8,—Read February 25, 1897.

The following is a brief summary of certain results which we have obtained in the investigation of the relations prevailing between the cerebellum and other parts of the nervous system, and which we commenced in consequence of an observation made by one of us (L), on the 24th May, 1895.

This consisted in the observation that when both cerebral hemispheres were removed and, as a result, active extension tonus* of the limbs was obtained, excitation (faradic) of the upper surface of the cerebellum caused immediate relaxation of such tonus so long as

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* We venture to propose the term " accrebral " tonus for the phenomenon, to avoid unnecessary periphrasis, and to distinguish it from that observed after removal of the cerebellar hemispheres.